

DESCRIPTION AND LIFE HISTORY OF A NEW SPECIES OF *NEMATUS*
(HYMENOPTERA: TENTHREDINIDAE) ON *ROBINIA HISPIDA*
(FABACEAE) IN NEW YORK

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Abstract.—*Nematus hispidae* Smith, n. sp., is described from a large series of adults reared from *Robinia hispida* in Ithaca, N.Y. Aspects of biology and life history are discussed and compared with that of *N. tibialis*. Notes on parasitism by *Cleptes semiauratus* (Hymenoptera: Chrysididae: Cleptinae) and the current distribution of this parasitoid in North America are presented.

The rose acacia, *Robinia hispida* L. (Fabaceae), is a widely planted ornamental shrub, native to southeastern U.S.A. In 1980 a large population of sawfly larvae was observed defoliating a stand of rose acacia on the Cornell University campus at Ithaca, N.Y. Discussions with Cornell's cooperative extension associates provided no insight into the identity of the sawfly. Apparently, sawflies attacking the rose acacia had attracted little attention in the past. A large series of larvae were collected and reared to adults. Specimens were sent to DRS for identification. When it became apparent that the species was either new to science or new to the U.S., more detailed biological studies were initiated by DCD. It was eventually determined that there are two species of *Nematus* feeding on *R. hispida*, one of which was undescribed. In this paper *Nematus hispidae* n. sp. is described and its life history is summarized and compared with *N. tibialis* Newman, the other species feeding on the rose acacia.

The sections on the taxonomy are by the junior author, those on the life history and parasitism are by the senior author.

Nematus hispidae Smith, NEW SPECIES

Figs. 1-5, 9, 10

Female.—Length, 5.5-7.0 mm. Dark yellow with following black: Antenna (except anterior surface of scape), ocellar and postocellar areas with black expanded anteriorly in short armlike extensions one directed toward each antenna, large triangular spot on mesoprescutum, longitudinal broad stripe on each lateral lobe of mesonotum, posterior half or less of mesoscutellum with mesal stripe extending forward, mesopostergite, sometimes upper half of mesepimeron and extreme upper corner of mesepisternum, metascutellum and area surrounding

cenchri, mesal portion of terga 1–8 appearing as a broad longitudinal dorsal stripe, hindtarsus, and sheath (except base); hindtibia darkened, increasingly dark to almost black toward apex; apex of mandible reddish brown; wings hyaline, veins brown, stigma amber.

Shining, covered with fine white pubescence. Antennal length about $2\frac{1}{2}$ head width, in ratio of 6.0:2.3; 1st and 2nd segments each broader than long, segments 3–5 subequal in length, segments 6–9 slightly decreasing in length. Clypeus circularly emarginated for nearly $\frac{1}{2}$ its medial length; malar space subequal to diameter of front ocellus; distances between eye and hindocellus, between hindocelli, and between hindocellus and posterior margin of head subequal. Hindbasitarsus shorter than length of following segments combined, as 2.0:2.7. Tarsal claw with long inner tooth. Sheath slender and tapering to pointed apex in dorsal view, in lateral view straight above, rounded below (Figs. 1, 2). Lancet with about 19 serrulae, each serrula flattened, separated by shallow circular notch, and with about 10 subbasal teeth on ventral margin; short intersegmental hairs present (Fig. 3).

Male.—Length, 5.0–6.0 mm. Coloration similar to that of female but black areas slightly more extensive: black in front of ocelli not always produced into armlike extensions, anterior margin of black straight or rounded, extending about halfway to antennae; mesonotum mostly black, at most with pale areas on sutures separating prescutum and lateral lobes; spots on meson of terga slightly broader. Structural characters as for female. Genitalia in Figs. 4, 5.

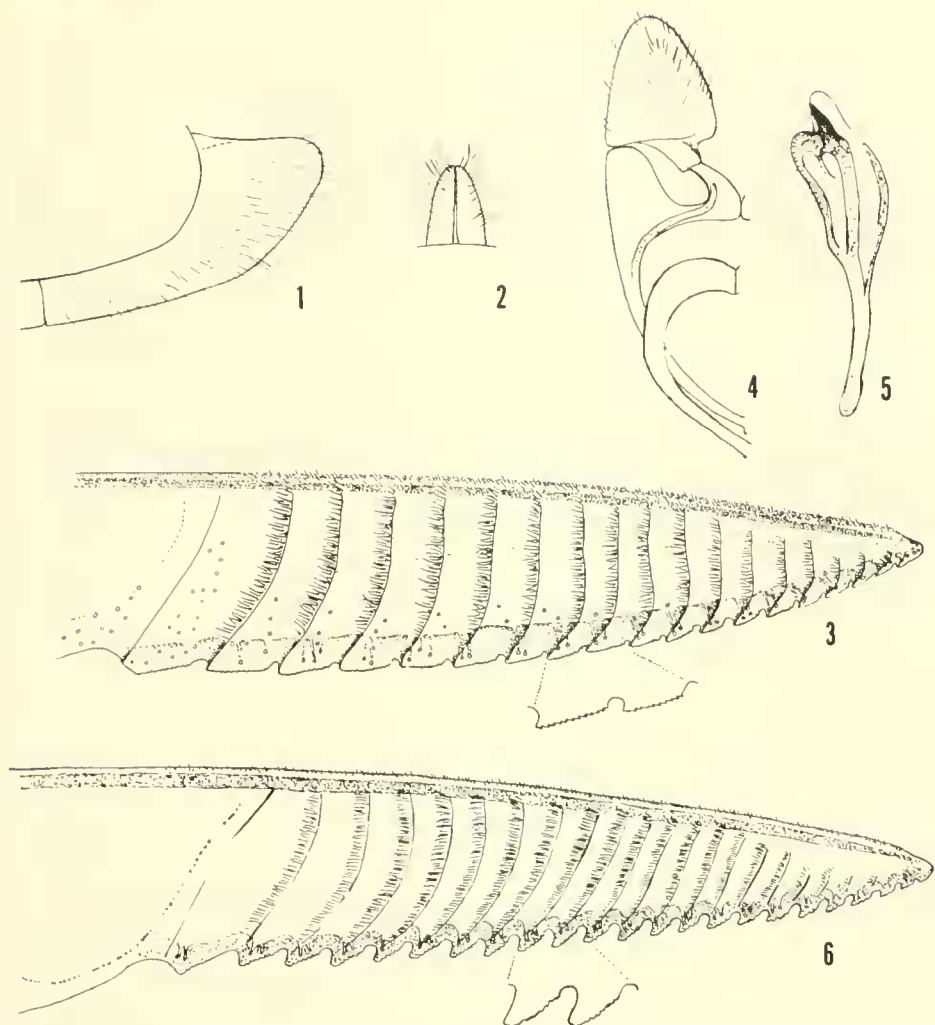
Holotype.—♀, New York, Tompkins Co., Ithaca, reared 80-05, D. C. Darling; defoliating *Robinia hispida*, Cornell campus, lab reared. Collected as late-instar larvae 10 June 1980, adult first emerged 30 June 1980. Deposited in Cornell University Insect Collection.

Paratypes.—14 ♀, 8 ♂, same data as for holotype. Deposited at Cornell, the National Museum of Natural History, Washington, D.C., the Canadian National Insect Collection, Ottawa, and Oregon State University Insect Collection, Corvallis.

Host.—*Robinia hispida*.

Larva.—Typical of the Nematinae and *Nematus*, with prolegs on abdominal segments 2–7 and 10, antenna conical, and 10th tergum with a pair of caudal protuberances. Early feeding stages dark blackish (Fig. 9). Late feeding stages green when alive, with head and 10th tergum amber and with black tubercles on body. Abdominal segments 1–8 apparently 5-annulate with black tubercles as follows (Fig. 10): 1st annulet with one small spot laterally; 2nd annulet with 2 large spots above spiracle; 3rd annulet with 2 small spots posterior to spiracle; 4th annulet usually with 4 spots, the upper 2 the largest; 5th annulet without spots; large spot on subspiracular lobe; 3 nearly confluent spots on surpedal lobe. Prepupa without spots, entirely green.

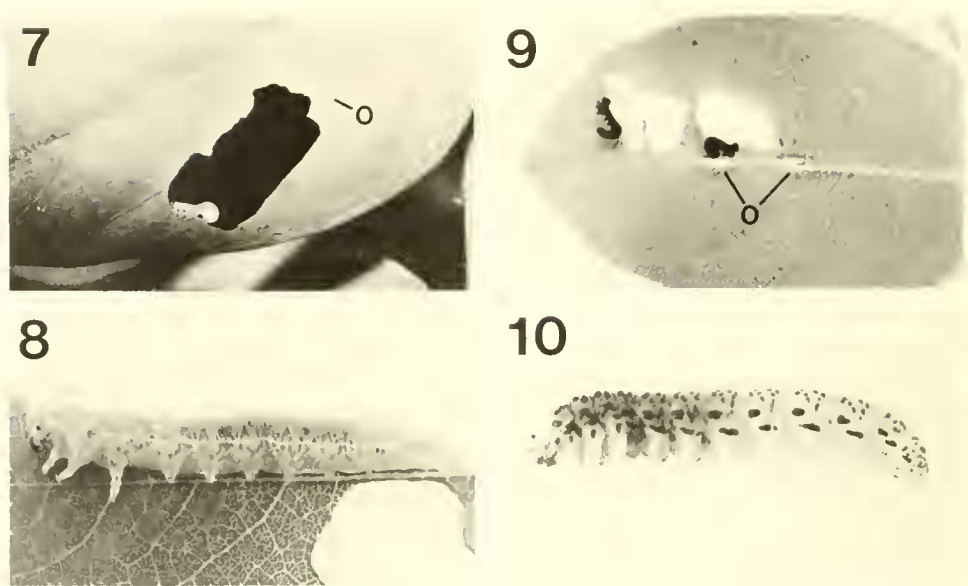
Remarks.—*Nematus hispidae* belongs in the *oligospilus* group of *Nematus* because of its long slender sheath and long lancet with intersegmental hairs; other groups may have the sheath apex expanded or have a very short sheath which is not longer than high and the lancet may be bare, with intersegmental spines, or be very short and triangular. Among species in the *oligospilus* group, structural characters and coloration place *hispidae* close to *tibialis* Newman, but it is separated from *tibialis* by the black or partly black meso- and metascutella (dark



Figs. 1-6. 1-5, *Nematus hispidae*. 1, Sheath, lateral view. 2, Sheath, dorsal view. 3, Lancet. 4, Harpe and parapenis, ventral view, left half. 5, Penis valve. 6, *Nematus tibialis*, lancet.

yellow in *tibialis*), the paler hindtibia (black in *tibialis*), and the flat serrulae of the lancet (deep and pointed with distinct anterior and posterior margins in *tibialis* (Fig. 6)). The male of *tibialis* is not known. The following characters will help distinguish *hispidae* from other members of the *oligospilus* group: short malar space (some species, like *oligospilus* Foerster, have a broad malar space, more than twice the diameter of an ocellus); flat serrulae (deeper and pointed in most other species); and mostly black dorsum (other species are not as extensively black or are all yellowish to orange). The male can be separated only by comparing the genitalia with the illustrations, Figs. 4-5. The larvae of *hispidae* differ from *tibialis* also, as will be discussed subsequently.

This new species was first expected to be *tibialis*, but after close examination it was evident that two species are involved. Since specimens could be masquer-



Figs. 7-10. 7, 8, *Nematus tibialis*. 7, Oviposition scar and first-instar larva. 8, Final instar larva. 9, 10, *Nematus hispidae*. 9, Oviposition scars and first-instar larvae. 10, Final instar larva. O = oviposition scar.

ading under *tibialis* in collections, all available collections of that species were checked, but no additional specimens of *hispidae* were found. It is possible that the species was adventive from the Old World, but I have checked many Palearctic species as well as keys to species of that region and have found nothing that resembles *hispidae*.

Larvae associated with *Robinia* in the USNM collection were checked, and I found a number that resemble the larvae of *hispidae* though none are with associated adults. These larvae are from the following: Pa., Perry Co., Toboyne Township, May 29, 1980, defol. black locust; Md., Caroline Co., Denton, May 23, 1973, on locust; S.C., Clemson, April 20, 1955, black locust; N.C., Mt. Mitchell, August 26, 1950, *Robinia hispida*; Mass., Eastham, June 12, 1957, *Robinia pseudoacacia*; Okla., Stillwater, May 4, 1965, on black locust. Though adults of *hispidae* are known only from the type-locality, these records of larvae indicate a wide distribution and the possibility that other species of *Robinia* may be hosts.

A COMPARISON OF THE LIFE HISTORY OF *NEMATUS HISPIDAE* AND *N. TIBIALIS*

Surveys were initiated in early May of 1981, 1982 and 1983, before the buds of *Robinia hispida* were opened. Eggs and first-instar larvae were first observed around the middle of May. Eggs could be found in two sites on the compound leaves of the plant and the associated first-instar larvae differed dramatically in color. The most abundant oviposition sites were blister-like swellings on the surface of the leaf (Fig. 7). All newly emerged larvae feeding in the vicinity of these oviposition sites were pale greenish-white with a brown head capsule (Fig. 7). Oviposition also occurred in the midribs (Fig. 9). First-instar larvae associated

with this oviposition site were uniformly black (Fig. 9). In one instance, the emergence of an entirely black larva from a swelling in the midrib was observed in the laboratory. There were also two distinct types of later-instar larvae on *R. hispida*—uniform green (Fig. 8) and green with very prominent and contrasting black tubercles (Fig. 10). The blister-like oviposition scar, light green first-instar larva and final instar larva also of uniform color agree exactly with the descriptions provided by Comstock (1880) for *tibialis* (cited as *N. similis* Norton) feeding on *Robinia pseudoacacia* (black locust) in Washington, D.C. The identity of these sawflies as *tibialis* is further supported by the results of oviposition observed under laboratory conditions in 1983. Field collected females were isolated with twigs of *R. hispida* that were determined to be free of eggs. Only blister-like oviposition scars were subsequently located and only uniformly green first-instar larvae emerged. Examination of the lancets of the females isolated with the twigs confirmed their identity as *tibialis*.

There also appear to be differences in the phenology of the two species of *Nematus* in Ithaca. *Nematus hispidae* directly developed to the adult stage and does not have an obligate diapause. Larvae were collected June 9 and 10, 1980 and pupation occurred between June 11 and 15. Adults emerged during the last week of June and first week of July. In 1981 and 1982 only *tibialis* was abundant in the study area. Individual larvae were reared to pupation. None emerged that summer, and the cocoons were overwintered at 5°C. Unfortunately, development did not resume the following spring. Consistent with these negative results and the seasonal abundance of the sawfly population, is the suggestion that *tibialis* is univoltine with an obligate diapause, probably mediated by photoperiod. This would explain my inability to break the diapause; photoperiod was not carefully regulated. Comstock (1880) states there are two and possibly 3 broods of *tibialis* in Washington, D.C.

Reproduction is also different in these two species. *Nematus tibialis* is parthenogenetic (thelytokous), whereas *hispidae* is bisexual, males and females occurring in approximately equal numbers.

PARASITISM OF *NEMATUS HISPIDAE*

In the early summer of 1981, the year following the defoliation of *R. hispida*, *Cleptes semiauratus* (L.) [Hymenoptera: Chrysididae: Cleptinae] was abundant in the study site. A one hour sampling period on June 11 produced approximately 25 specimens, and many more of the fast-flying wasps evaded capture. The wasps were observed on the leaves, areas frequented by the *Nematus* larvae.

Kimsey (1981) reviewed the Cleptinae of the New World and noted that *C. semiauratus* is "undoubtedly adventive" in eastern North America with the only previous records from New Jersey. This suggests the possibility that we were dealing with a recently introduced sawfly. Two factors suggest that *hispidae* is not recently introduced from the Palearctic. Firstly, both the sawfly (see "Remarks" section) and the parasitoid are known from many collecting localities in eastern North America. There is an additional specimen of *C. semiauratus* in the Cornell Collection [NY: Ludlowville, L. L. Pechuman, 30 June 1981] about 7 miles from type locality of *N. hispidae*, and also a specimen from Canada [Ontario: Hamilton, VI 19 1979, K. L. Bailey] in the University of Guelph collection. Secondly, the genus *Robinia*, the food plant of the sawfly, is restricted to the New World (Willis,

1973). It seems more likely that *hispidae* is an uncommon species endemic to the southern U.S., the range of its host plant, *R. hispida*. The planting of the ornamental rose acacia in northeastern U.S. provided an opportunity for *C. semiauratus* to parasitize *hispidae*.

I was also able to demonstrate parasitism in the laboratory. *Cleptes semiauratus* adults were brought back to the lab and a female was placed in a petri dish with a *Nematus* cocoon. The identity of the cocoon, *tibialis* or *hispidae*, was uncertain. The female immediately began to examine the cocoon and was left with the cocoon overnight. Cleptines chew a hole in the host cocoon and deposit an egg with the tubular ovipositor characteristic of Chrysididae. They then seal up the hole with masticated leaf litter (Clausen, 1940). This plug was observed the next day. The sawfly cocoon was dissected in mid-winter and the characteristic cleptine larvae was found in the cocoon. This specimen is deposited in the Cornell University Insect Collection, Lot #1123. Unfortunately, this experiment could not be replicated due to the small numbers of sawflies collected in 1981 and 1982.

Cleptes semiauratus was not observed in the study area in 1980, the year of peak abundance of *hispidae*. The marked increase in the numbers of the parasitoid was correlated with a drastic decline in the population of *hispidae*. Parasitism by *Cleptes semiauratus* may have been responsible for the dramatic decrease in the populations of *Nematus* on *Robinia hispida* in Ithaca, N.Y. This suggestion is supported by the documented ability of *C. semiauratus* to attack *Nematus* in North America and the host range of nematine tenthredinids attacked in Europe, *Nematus* spp., *Pachynematus* spp. and *Pristiphora abietina* (Christ) (see Gauss, 1964).

ACKNOWLEDGMENTS

We thank E. R. Hoebeke, W. T. Johnson, and L. L. Pechuman, Cornell University; H. Goulet, Biosystematics Research Institute, Agriculture Canada, Ottawa; and R. L. Smiley and A. S. Menke, Systematic Entomology Laboratory, USDA, Beltsville, Maryland, and Washington, D.C., respectively, for assistance with preparation and review of the manuscript. Special appreciation is extended to William L. Brown, Jr.; his keen observations first brought the population of this new species to our attention.

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